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Effective Analgesia with Erector Spinae Plane Block in a 3-Year-Old Patient Undergoing Thoracotomy: A Case Report

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Case Report

Abstract

Thoracotomy is associated with significant postoperative pain in pediatric patients. Inadequately managed postoperative pain can lead to complications such as atelectasis and pneumonia due to impaired deep breathing and coughing, and insufficient analgesia within the first 24 hours may increase the risk of developing chronic pain. We present a pediatric patient who underwent thoracotomy and whose postoperative pain was managed with an erector spinae plane block (ESPB). After obtaining informed consent from the patient's parents, a 3-year-old girl weighing 14 kg was taken to the operating room, where standard monitoring was applied. Anesthesia was induced with 2 mg/kg propofol, 1 µg/kg remifentanyl, and 0.5 mg/kg rocuronium. Two minutes after induction, the patient was intubated with a 4 mm internal diameter endotracheal tube. At the end of the 120-minute surgical procedure, ultrasound guidance was used to identify the erector spinae muscle and transverse processes at the T5 thoracic vertebral level. Using the in-plane technique in a craniocaudal direction, 10 mL of 0.25% bupivacaine was injected into the fascial plane between the erector spinae muscle and the transverse process. At the second postoperative hour, the patient was awake and cooperative; the FLACC (Face, Legs, Activity, Cry, Consolability) pain score was recorded as 1. Postoperative pain management following thoracotomy is most commonly achieved using thoracic epidural or paravertebral catheters; however, both techniques carry significant risks and are technically challenging to perform in pediatric patients. This case suggests that the erector spinae plane block (ESPB) may be an effective analgesic technique in pediatric thoracic surgeries.

Keywords:

Erector spinae plane block,
pediatric surgery,
postoperative pain,
thoracotomy

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Introduction

Hydatid disease (HD) has been recognized since the time of Hippocrates and remains a prevalent zoonotic infection in regions where livestock farming is common and preventive measures are inadequate. The causative agent is *Echinococcus granulosus*, a cestode-class parasite. In children, the pattern of organ involvement differs from that in adults; while the liver is the most commonly affected organ in adults, pulmonary involvement is more frequent in pediatric cases [1].

The primary treatment for pulmonary hydatid cysts is surgical excision. The goals of surgery are complete removal of the parasitic cyst, prevention of dissemination due to intraoperative rupture, maximal preservation of lung parenchyma,

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and obliteration of any residual cavity. Thoracotomy is typically required for this surgical approach. However, thoracotomy is known to cause considerable postoperative pain, particularly in pediatric patients. Inadequate pain control can impair effective coughing and deep breathing, leading to secretion retention, atelectasis, and pneumonia. Thus, effective postoperative analgesia is of critical importance [2].

Although regional techniques such as thoracic epidural and paravertebral blocks are effective options, their invasive nature and higher complication risk limit their use in the pediatric population [3]. The erector spinae plane block (ESPB), first described in 2016, is a relatively novel regional anesthesia technique involving the injection of local anesthetic between the erector spinae muscle and the transverse process. It is technically simpler to perform than a paravertebral block and is associated with a lower risk of complications. ESPB has been successfully employed in a variety of surgical procedures and has been shown to provide effective analgesia [4].

In this case report, we aim to present our experience with ESPB for postoperative pain management in a 3-year-old pediatric patient undergoing left thoracotomy.

Case Report

A 3-year-old girl weighing 14 kg was being followed for hydatid cysts involving both lungs and the liver. She had previously undergone surgery for hydatid cysts located in the right lung and liver (Figure 1). A second surgical procedure was planned to excise the hydatid cyst in the left lung via thoracotomy.

Informed consent was obtained from her parents prior to the procedure. Upon arrival in the operating room, standard monitoring was applied, including pulse oximetry, electrocardiography, and noninvasive blood pressure measurement. A 22-gauge intravenous cannula was inserted for vascular access. General anesthesia was induced with 2 mg/kg propofol, 1 µg/kg remifentanyl, and 0.5 mg/kg rocuronium administered intravenously.



Figure 1. Preoperative chest X-ray of the patient

Two minutes after induction, the patient was intubated with a 4 mm internal diameter endotracheal tube.

The patient was placed in the lateral decubitus position with the surgical site facing upward. The surgeon then proceeded to mark the patient's anterior and posterior axillary lines. A line was imagined, with a starting point at the angulus scapula and an ending point at the xiphoid process, which is located at the lowermost end of the sternum. The segment of the line between the two

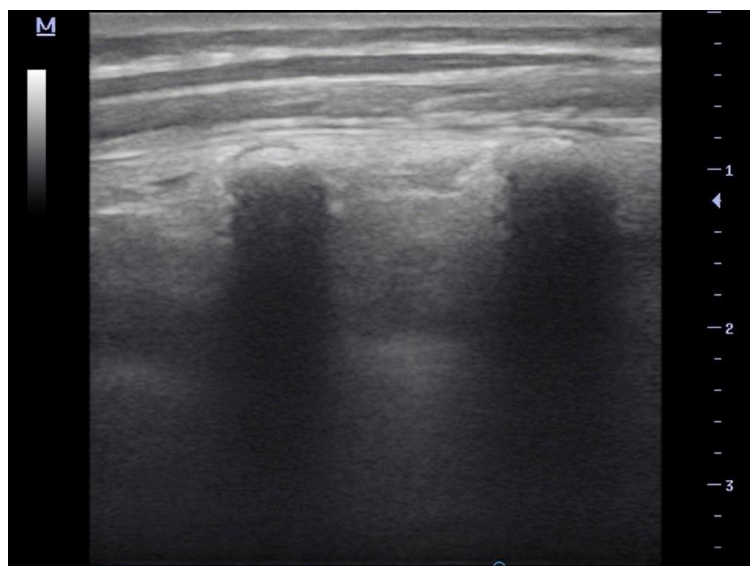


Figure 2. Ultrasound image demonstrating the injection site for the erector spinae plane block.

axillary lines was designated as the surgical incision area, and a 5-centimeter skin incision was performed. Anesthesia was maintained with 2% sevoflurane in a 50:50 mixture of air and oxygen. No additional opioids or analgesics were required intraoperatively unless the heart rate exceeded 15% of the baseline. Postsurgically, a single chest drain was placed in the patient. The duration of surgery was 120 minutes.

At the end of the procedure, a left-sided erector spinae plane block (ESPB) was performed under ultrasound guidance to provide postoperative analgesia (Figure 2). Ultrasound (US) imaging was used to identify the erector spinae muscle and transverse processes at the T5 thoracic vertebral level. The probe was then moved laterally to the right, allowing visualization of the transverse processes along with the erector spinae, rhomboid, and trapezius muscles. The US confirmed hydrodissection beneath the erector spinae muscle with 2 mL of saline. Using an in-plane technique in the craniocaudal direction, 10 mL of 0.25% bupivacaine was injected between the erector spinae muscle and the transverse process.

In addition, 10 mg/kg of intravenous paracetamol was administered 30 minutes before the end of surgery. The same dose of paracetamol was repeated at the 8th and 16th postoperative hours.

At the second postoperative hour, the patient was awake and cooperative; the FLACC (Face, Legs, Activity, Cry, Consolability) pain score was recorded as 1. The scheduled systemic analgesic administration was performed at the fourth postoperative hour. No additional analgesics or opioids were required. During follow-up visits at the 4th, 8th, and 24th postoperative hours, the FLACC score remained 1. No abnormalities were observed in respiratory rate or peripheral oxygen saturation monitoring.

Discussion

Thoracotomy is a surgical procedure that can result in significant postoperative pain in pediatric patients. Post-thoracotomy pain may arise from multiple factors, including skin incision, muscle dissection, intercostal

nerve injury, pleural irritation, chest drain placement, and rib retraction. The literature indicates that children undergoing thoracotomy report higher pain scores compared to those undergoing abdominal or extremity surgery. Inadequately treated postoperative pain can impair deep breathing and effective coughing, potentially leading to complications such as atelectasis and pneumonia. Moreover, insufficient analgesia during the first 24 hours is considered a risk factor for the development of chronic pain [5–7].

Therefore, regional anesthesia techniques are essential in minimizing or eliminating opioid requirements in pediatric patients. However, conventional methods such as thoracic epidural and paravertebral blocks are not always ideal in this population due to technical challenges and the risk of complications such as dural puncture, infection, hypotension, or motor blockade. In this context, the erector spinae plane block (ESPB) has gained attention for its effectiveness and safety profile [6].

The erector spinae plane block (ESPB) involves the injection of a local anesthetic solution between the erector spinae muscle and the underlying transverse process under ultrasound guidance. The local anesthetic agent administered demonstrates its effect on the ventral and dorsal rami of the spinal nerves. The terminal branches responsible for sensory innervation of the entire anterolateral abdominal wall with the ventral ramus are blocked. The two terminal branches that provide innervation of the posterior abdominal wall with the dorsal ramus are affected. Furthermore, it disseminates to the paravertebral space via the costotransverse foramina, thereby providing visceral and somatic analgesia [8]. Its main advantages include ease of application, minimal technical difficulty, and a low complication rate. Complications arising from the procedure are exceedingly rare, largely due to the injection site's distance from the pleura, large blood vessels, and spinal cord. The primary complications associated with this procedure include infection at the needle insertion site, local anesthetic toxicity or allergy, vascular puncture, pleural puncture, pneumothorax, and

failed block [9].

Compared to traditional techniques such as the paravertebral block, ESPB is less invasive, which is a particularly significant benefit in pediatric patients. Since 2017, ESPB has been increasingly utilized in the pediatric population for perioperative analgesia in a variety of surgical procedures, including thoracic, abdominal, renal, hip, and femoral surgeries [5,10,11]. Various administration techniques have been described in the literature, including single-shot, intermittent bolus, and continuous catheter infusion [11]. The spread of local anesthetic across the fascial plane allows for multisegmental dermatomal coverage, which offers a distinct advantage in surgeries such as thoracotomy, where pain may originate from multiple segments.

There are a limited number of studies on this subject. As a result of case presentations, it was concluded that the application of ESPB in conjunction with general anesthesia provides effective surgical analgesia and satisfactory postoperative pain control in pediatric thoracotomy surgery. Furthermore, it was determined that US-ESPB is a promising regional analgesic technique in pediatric thoracotomy cases. In clinical studies, it has been reported that ESPB provides postoperative analgesia similar to that of TEA in pediatric patients undergoing thoracotomy. Furthermore, ESPB has been shown to be a simpler procedure, with a faster recovery time and a lower complication rate [12,13].

In the context of ESPB applications, 0.25% bupivacaine was identified as the optimal dose concentration, a recommendation that was subsequently adopted. The efficacy of ESPB application in the management of postoperative analgesia in thoracotomy patients is contingent on the volume administered. In this particular instance, it has been demonstrated that the efficacy of analgesia is contingent upon the administered volume. However, studies have indicated that an analgesic effect can be provided with a lower volume of up to 0.3 mL/kg [12].

ESPB has also found application beyond perioperative pain management and is being used for the palliation of various acute and chronic pain syndromes. Additionally, it may serve as a safer alternative in pediatric patients with coagulopathy or in whom thoracic epidural or paravertebral blocks are technically or clinically contraindicated [14]. Thus, ESPB stands out as a safe and effective regional anesthesia technique with an expanding range of indications in children.

Recent research has revealed the emergence of new fascial plane blocks for the management of postoperative pain in pediatric thoracic surgery. The most recent of these is the Serratus Anterior Plane Block [15]. As experience with this block increases, comparative clinical studies of new block types will also be published in the literature.

Conclusion

In the present case, ESPB was administered for postoperative pain management in a 3-year-old patient undergoing left thoracotomy, resulting in effective analgesia without the need for additional opioids. Pain scores remained low, no rescue analgesia was required, and the patient's vital signs remained stable. These findings suggest that ESPB may be an effective analgesic modality in pediatric thoracic surgeries.

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Ethics

Informed Consent

Written informed consent was not obtained due to the fully anonymized nature of the data. All clinical information has been de-identified to ensure that neither the patient nor any third party can be identified.

Author Contributions

Conceptualization: HK, MAK, Investigation/Data curation: VY, MBB, Methodology/Resources: MAK, MBB, Writing – original draft: HK, Writing – review & editing: MAK, VY, MBB, RA, Visualization (figures): RA, Supervision/Project administration: HK, MAK,

Declaration of Interests

The authors declare no conflicts of interest and no competing interests relevant to this work.

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